TACOM
Lethality, Survivability, Mobility and Sustainment for America's Army

Multi-Role Aviation Weapon System (MRAWS) Trade Study

NDIA 36th Annual Gun & Ammunition Symposium

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ARDEC Anti-personnel Modeling

Approach:

Determine the effectiveness baseline of the current system (cartridge and turret) against the various personnel target types.

Compare this baseline to changes in effectiveness resulting from the performance enhancements of the Precision Electric Turret only, A30CR only, & then Precision Electric Turret plus A30CR.

Models Used (Latest AMSAA Versions)

- CASRED- Casualty Reduction Model computes probability of incapacitation as a result of a round or fragment impact for an individual target with or without ballistic protection.
- F-BAR- Fractional Casualties Model determines the fraction of individual targets incapacitated from burst fire of either non-fragmenting projectiles or fragmenting projectiles. Fragmenting projectiles can either be air-burst or ground burst munitions. Multiple individual targets can be distributed within a defined target area. Multiple bursts as well as multiple aim points can be defined.

Procedure Used

- Fragmentation data in CASRED format for the current 30mm warhead was used.
- Error Budgets were used which were developed by Boeing.
- CASRED runs were made to develop the P(I/Burst) for an M789 warhead at various burst heights.

Procedure Used (Cont'd)

Numerous F-BAR runs were made for two postures (standing, prone), two casualty criteria (30 second Assault and Defense) , 3 burst sizes (5, 10, 20) and two target types for the current turret system and the PET and the current M789 and the A30CR.

From the F-BAR runs relative incapacitation indexes were determined for each condition as well as Stowed kills

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Targets

- two area target types
  - dense; small area with soldiers randomly distributed with in the area (Boeing Target).
  - sparse; large area with 8 soldiers randomly distributed within the area (ARDEC Target)
- both area target types had soldiers separated by at least 1 meter

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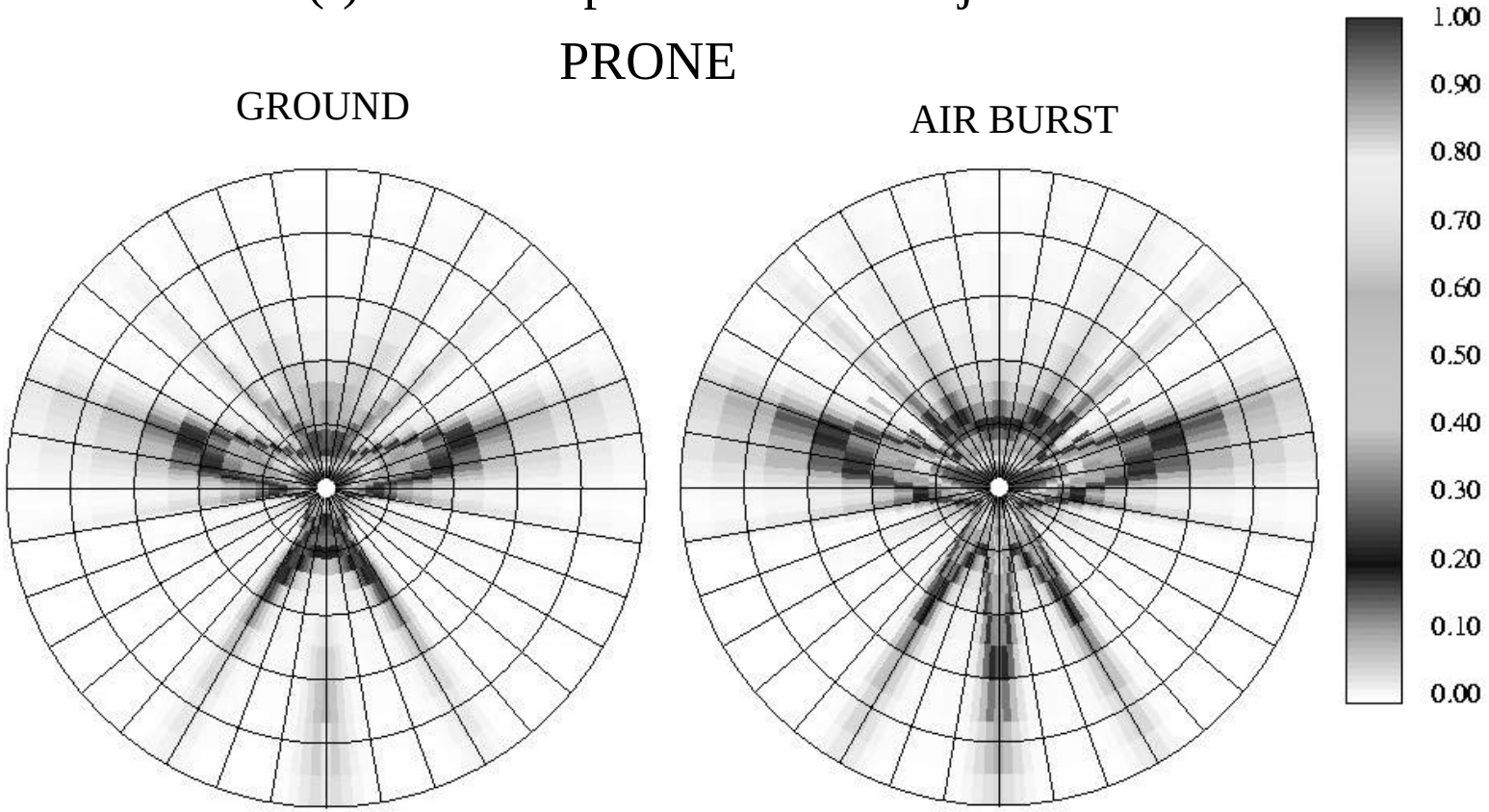
P(I) Grid Sample for M789 Projectile

PRONE

GROUND

AIR BURST



Aiming Points

- For the dense target;

  -the desired aim point was at the center of the target area (length & depth)

- For the sparse target;

  -the desired air point was at the center of the target area (depth)

  -varied by the number of bursts (a constant 20 rounds were fired with a set burst size at each aim point.

  -For 5, 10 and 20 round bursts there were 4, 2 and 1 evenly spaced aim points respectively.

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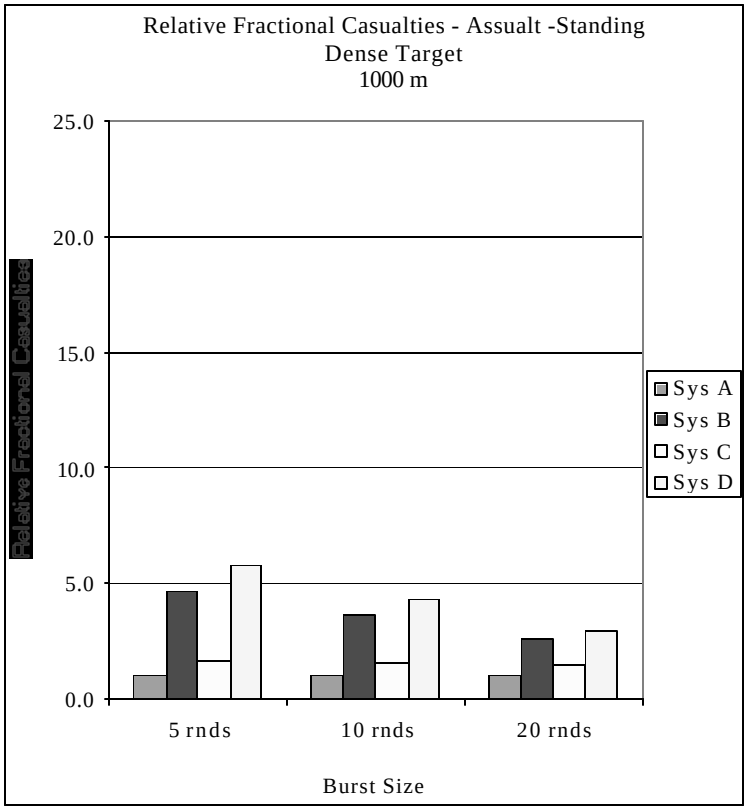
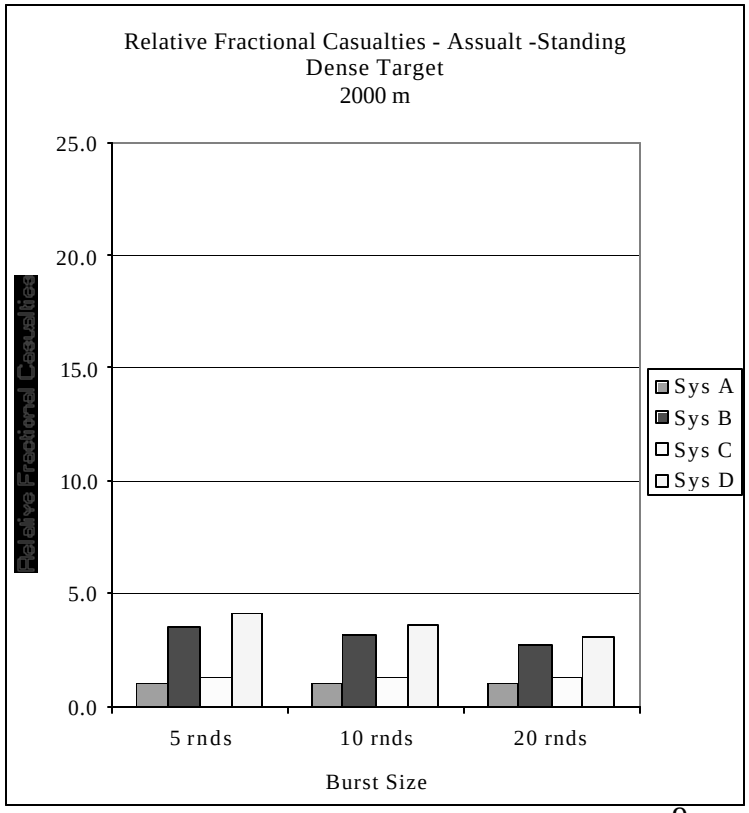
Relative Fractional Casualties (Sys A Baseline)





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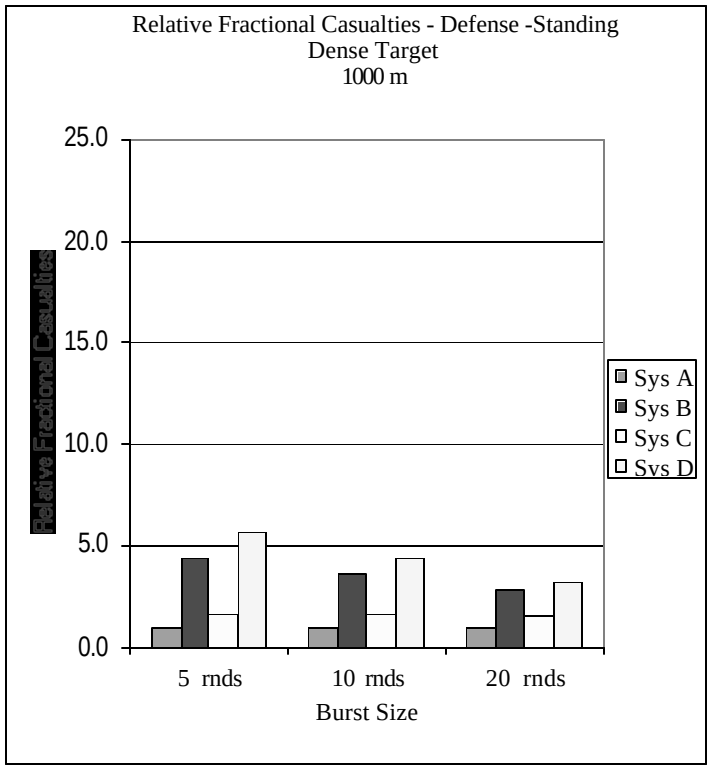

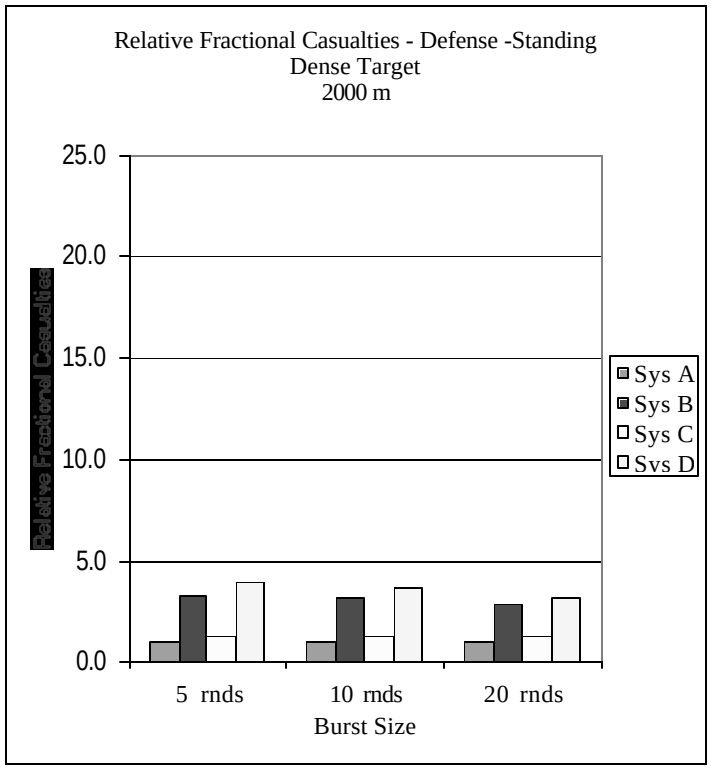

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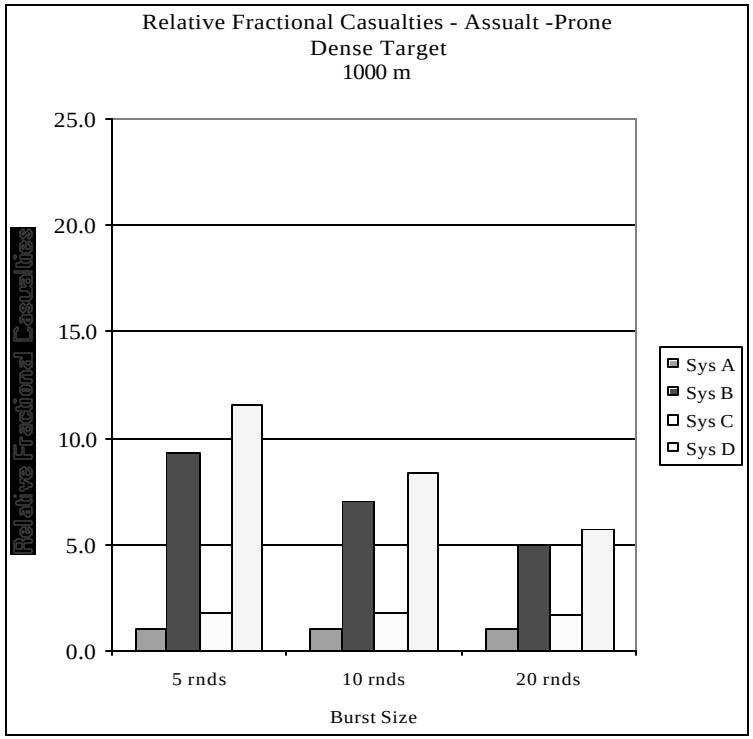

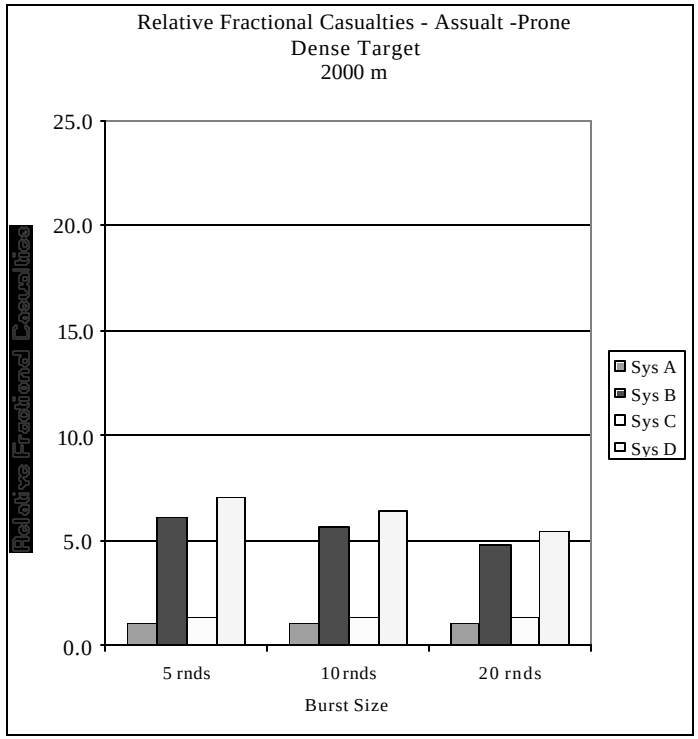

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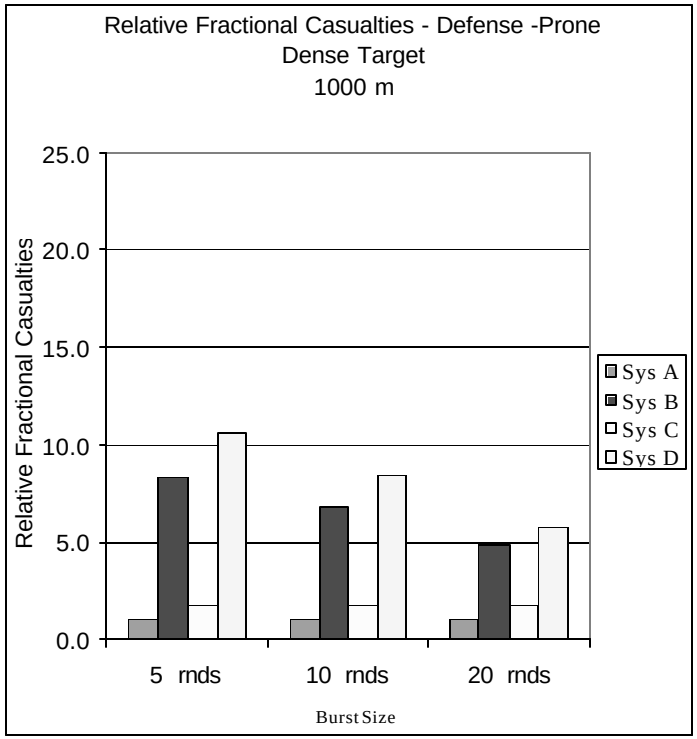

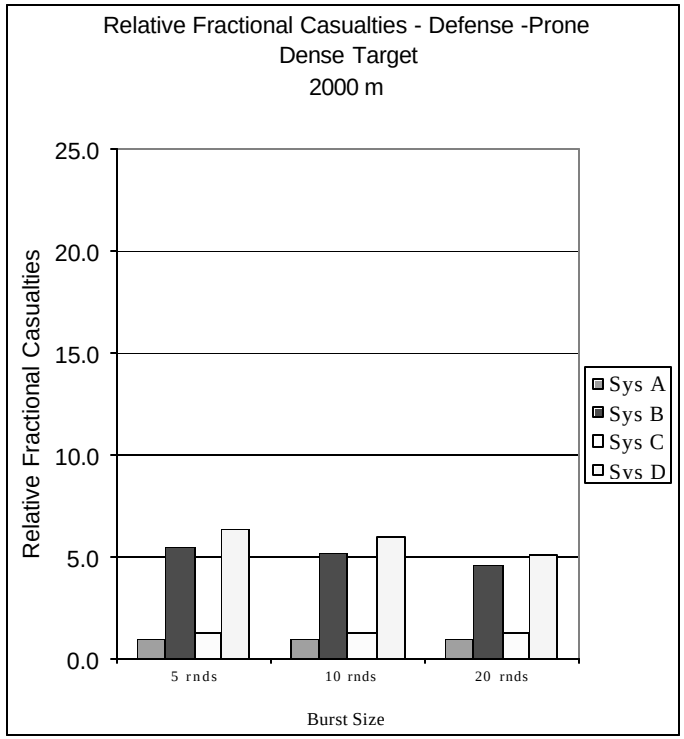

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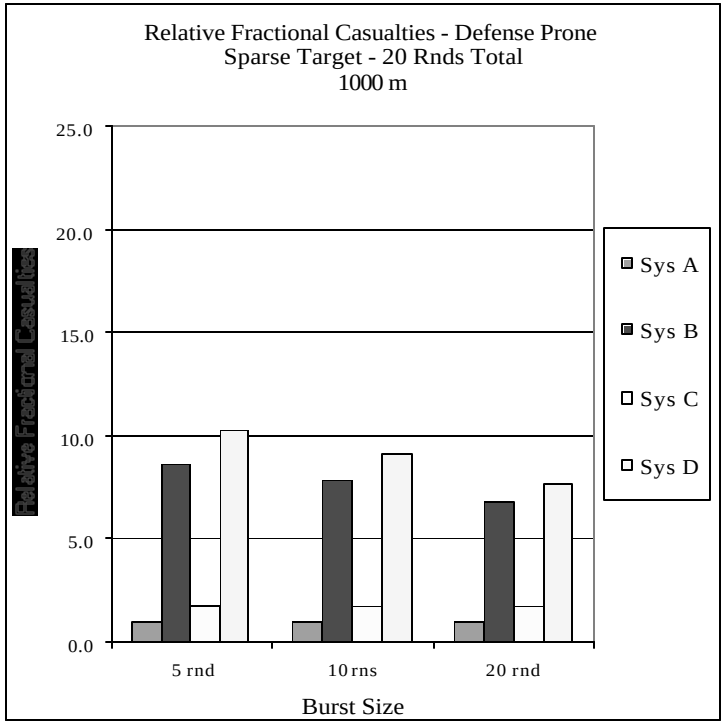
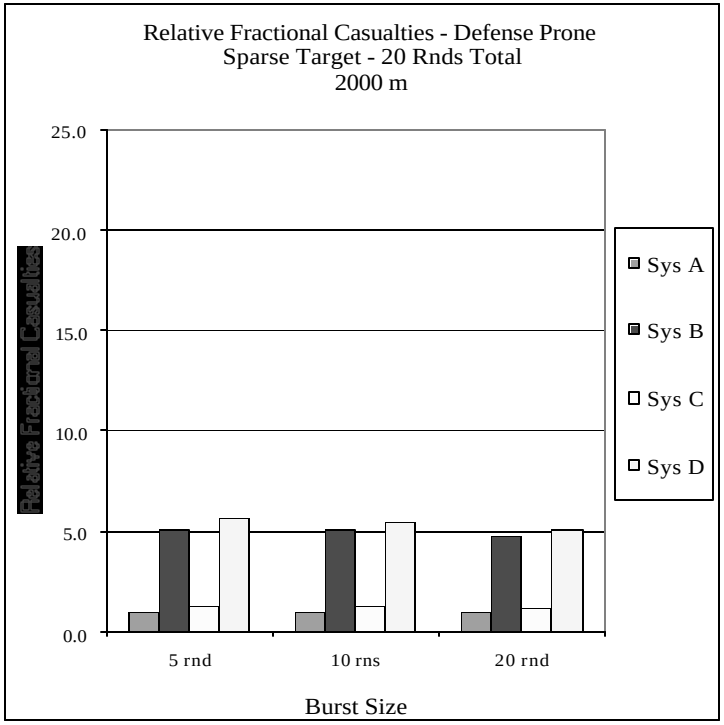
Relative Fractional Casualties (Sys A Baseline) Larger Area Target





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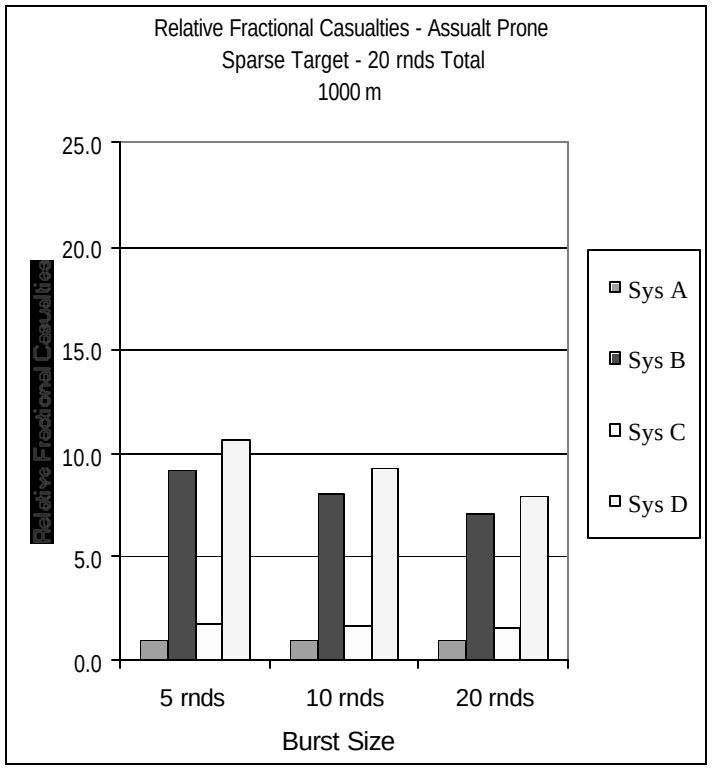
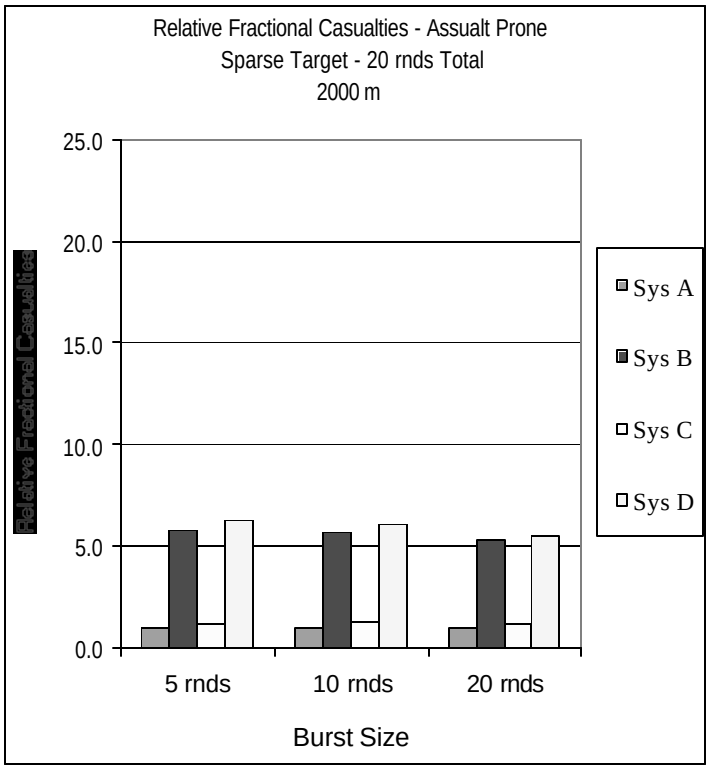
Relative Fractional Casualties (Sys A Baseline) Larger Area Target





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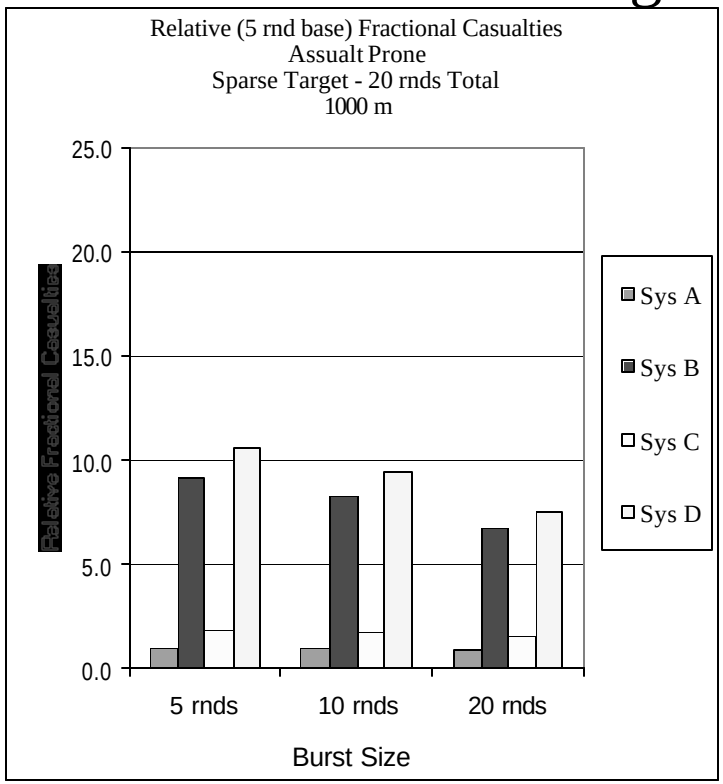
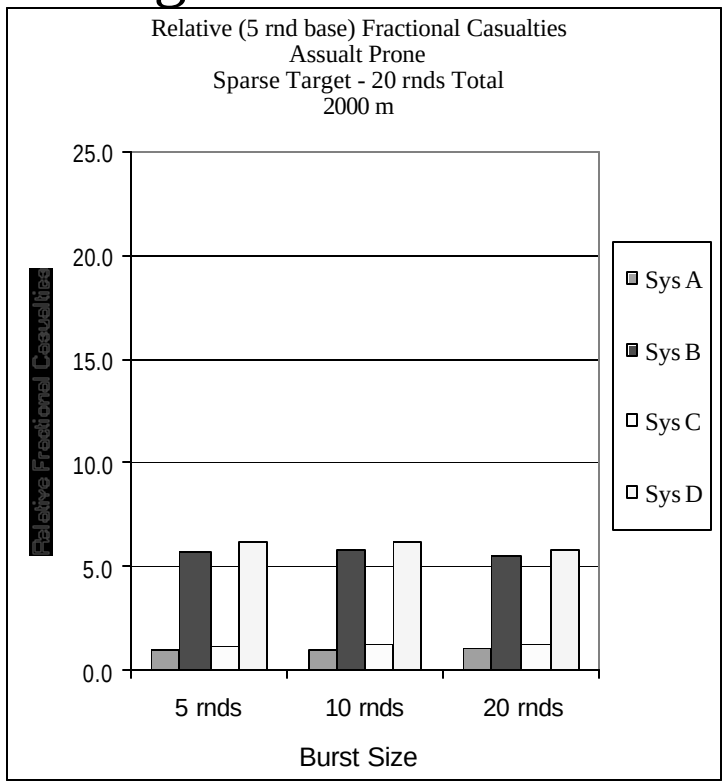
Relative Fractional Casualties (5 Rd Baseline) Larger Area Target





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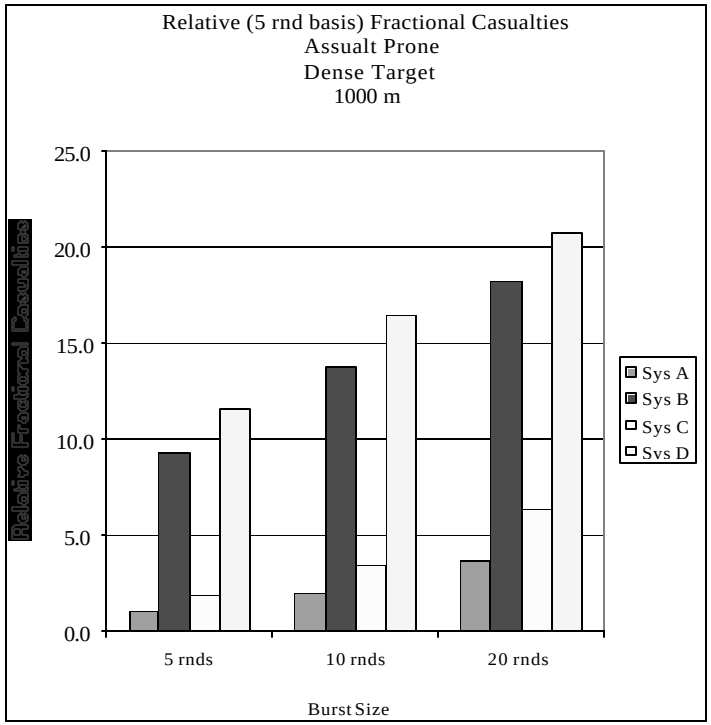
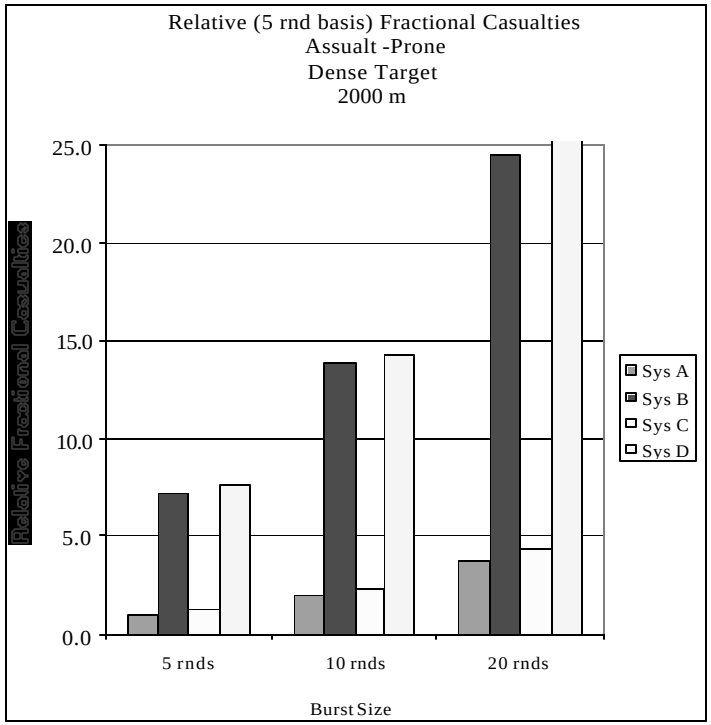
Relative Fractional Casualties (5 Rd Baseline)





Summary of ARDEC Modeling Results

	Percent Improvement	
•A30CR vs. Baseline -	Prone	Standing
•10 x 10 m x10-	455% TO 726%	180% to 340%
•10 x 50 m x 8-	376% to 761%	193% to 361%
•PET only vs. Baseline		
•10 x 10 m x10-	12.5% to 73%	9% to 68%
•10 x 50 m x 8-	7.7% to 79%	6.6% to 61%
•PET and A30CR-		
•10 x 10 m x10-	514% to 906%	210% to 464%
•10 x 50 m x 8-	405% to 925%	204% to 448%

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MRAWS Trade Study Conclusions
A30CR only (without PET)

- **Offers very large improvements in performance against personnel and aircraft at ranges where the gun is most likely to be used (far exceeding MRAWS goals)**
- **30% penetration improvement goal can be achieved via redesign of shaped charge liner**
- **Equivalent stowed kills expected with far fewer rounds**
- **Implementation will:**
  - **Require system changes to permit fuze setting (possibly necessitating re-qualification of the gun)**
  - **Result in increase in system weight (5+ pounds) and slight decrease in reliability.**
  - **Offer potential O&S cost reductions**

MRAWS Trade Study Conclusions (Cont'd) A30CR with PET

- **Offers best increase in performance at all considered ranges and target types**
- **Provides equivalent stowed kills with fewer rounds than the "A30CR only"**
- **Implementation will:**
  - **Require additional changes beyond those needed for "A30CR only" option**
  - **Offer potential for substantial weight savings and O&S cost reductions while improving system RAM characteristics**